

Mr. Bowers studied Chemistry at Queen Mary College (London University), and later gained a Post-graduate Diploma in Chemical Engineering from Surrey University to obtain Chartered Engineer status in the U.K. He is a Canadian citizen and Professional Engineer (Licence ON 04721015), and received a Fellowship from Engineers Canada for volunteer work as member and chair of PEO's Professional Standards Committee over a 15-year period.

Mr. Bowers has over 40 years of experience in civil/environmental consulting practice with municipal, provincial, and international governments as clients for water treatment plant design and water supply projects across Canada and internationally. Andy has been involved with numerous process/process control, SCADA system projects and assessments related to water treatment and supply, and wastewater treatment and collection systems. Previous experience included working at McMaster University, in Hamilton, Ontario on tertiary wastewater treatment research; and as a process engineer with a major U.K. fine chemicals manufacturer.

International Projects Experience

Trinidad and Tobago

World Bank project for Rehabilitation of Water Treatment Plants for the Water and Sewerage Authority.

Resident team Leader/Project Manager, responsible for providing process design consulting services for the design reports and development of tender documents for the rehabilitation of six water treatment plants in North Trinidad; ranging in size from 10MLD to 290MLD (2.5MGD to 64MGD). Plants processes included iron removal from groundwater, direct filtration from lake sources, and conventional full treatment from river sources. Reconstruction/expansion contracts were valued in excess of US \$50 million.

Changsha, Hunan Province, P.R. China

Project Manager/Engineer, responsible for the development of the conceptual process and layout for a proposed 1,000MLD (220MGD) full treatment plant for turbid river source water; provided preliminary cost estimating as part of a due diligence exercise for a PPP joint venture.

Panama, S.A.

Process Engineer, responsible for field studies as pre-design exercises to assess process suitability and develop process design parameters and cost estimates for new conventional full treatment water plant for Panama, S.A.

Shanghai, P.R. China

World Bank project for Shanghai involving water and stormwater systems. Final phase of a multi-million dollar series of studies on infrastructure strengthening. Semi-resident International Team Leader and overall project manager for comparative studies of water and stormwater regulation in Shanghai and major Western countries. The studies included regulations relating to raw, treated, and dischargeable water quality, source protection, analytical methods, organizational hierarchy, etc. Concurrent evaluations were made for the existing 24 Water Treatment plants (serving 28 million users) and multiple major distribution network pumping stations for process suitability, security assessments, resiliency assessments, etc. Short-term evaluations were completed for potential project delivery methods (PPP vs municipal operation); strategies for early warning of endocrine disruptors were developed; and an analysis was completed for the existing systems and operational strategies to

ensure drinking water quality was maintained during extended periods of upstream pollution events, algal blooms, and seasonal salt water influx into the Yangtze delta near intakes.

Water Treatment Experience

CFS Alert, Defence Construction Canada, Alert, NU

Project Manager, responsible for plant evaluations and on-site investigations of the water treatment plant and its distribution practices; as part of an additional treatment options analysis and report for water quality, in compliance with Health Canada requirements. Provided the development of life cycle costing for alternatives, including membrane filtration, ozone disinfection and UV irradiation.

Port aux Basques, NL

Project Manager, responsible for the preparation of an assessment report and subsequent design management to replace and upgrade all instrumentation, control, and process automation systems; and to provide SCADA system implementation for the 10,000m³/d (2.2MGD) surface water treatment plant.

CFB Gagetown, Oromocto, NB

Project Manager, responsible for the inventory and assessment of all instrumentation, control, and process automation / SCADA systems for a 13.6MLD (3.6MGD) surface water treatment plant. Developed a report assigning anticipated life-spans to each component, estimating replacement costs, and assigning replacement priorities in the 0-5 year, 5-10 year, and 10+ year periods.

Water Treatment Plant, Parks Canada, Terra Nova National Park, Clarenville, NL

Project Engineer, responsible for process evaluation and upgrade recommendations for a small capacity, high colour water source seasonal treatment facility.

Ajax Water Treatment Plant, Regional Municipality of Durham, Ajax, ON

Project Engineer, responsible for assisting to prepare an Environmental Assessment report; a Treatment Alternatives Health Effects report; Pre-design and design reports; acted as a process /process control advisor and provided the SCADA system design for 165MLD (36MGD) surface water plant.

Finch Water Treatment Plant, Ministry of the Environment, Finch, ON

Project Manager and Process Designer, responsible for a small 2-well system to treat a groundwater supply with high levels of hydrogen sulphide. Process involved pH adjustment, air stripping, filtration, and final pH correction.

Burlington Water Treatment Plant, Regional Municipality of Halton, ON

Project Manager and Process Designer, responsible for various expansion projects for a low lift pump station, filter expansions, new chemical building, new high lift pumping station, and yard piping for upgrades required to increase the water treatment plants to a 165MLD (36MGD) capacity. The project included pre-design reports, development of tender documents, and construction contract administration.

Bear Point Water Treatment Plant, City of Thunder Bay, ON

Project Manager and Process Engineer, responsible for testing for amphibole and chrysotile asbestos

fibre removal and development of overall process design and process control strategies for a 90MLD (20MGD) surface water treatment plant.

Oakville Water Treatment Plant, Regional Municipality of Halton, ON

Project Manager and Process Designer, responsible for expansion projects to upgrade filtration processes, and provide new chemical facilities and residuals management for a 110MLD (24MGD) surface water treatment plant.

Elgin-Middlesex PS Chlorination, London, ON

Process Engineer, responsible for preparing a report on alternate chemical delivery methods. Acted as Technical Advisor to the design team over the replacement of the existing hypochlorite system with gas chlorination.

Niagara Falls Water Treatment Plant, Regional Municipality of Niagara, ON

Project Manager and Process Designer, responsible for a filtration retrofit and upgrade, and the extension of chemical facilities for a 146MLD (32MGD) plant.

Pembroke Water Treatment Plant, City of Pembroke, ON

Project Manager and Process Engineer, responsible for the report and process design of a 36MLD (8MGD) river water plant.

South Sidney Water Treatment Plant, Township of Sidney, ON

Process Advisor and Co-Author of an operations manual for an 11.6MLD (2.5MGD) full treatment, plus ozonation and GAC filtration, surface water plant.

Georgina Water Supply Plant, Regional Municipality of York, ON

Treatment Process Controls Advisor and SCADA Specialist for a membrane plant that treats lake water.

Brechin Water Purification Plant, Township of Mara, Brechin, ON

Project Manager and Process Designer for a 5,000m³/d (1.2MGD) direct filtration plant that treats lake water.

Kingston Central Water Treatment Plant, City of Kingston, ON

Project Engineer, responsible for the process design and the operations manual for upgrades to a 108MLD (24MGD) plant.

Kettle Point Water Treatment Plant, Kettle and Stony Point, Forest, ON

Project Manager, responsible for a regulatory compliance report on the original facility, followed by a report, recommendation, and the process design for a new 1,500m³/d (0.3MGD) surface water treatment plant.

Pilot Plant/Process Testing, AB, ON

Process Engineer, responsible for numerous field studies as pre-design exercises to assess process suitability and/or develop process design parameters for water treatment the following locations: Ottawa, Ontario – ozonation; Calgary, Alberta – high-rate, high turbidity pre-sedimentation; Brockville, Ontario – direct filtration.

Supervisory Control and Data Acquisition (SCADA) System Experience

Wastewater Plant Services (PCS project), City of Toronto, ON

Project Manager, responsible for a multi-year Prime Technical Consultant assignment for plant services automation upgrades and SCADA integration at Highland Creek, Ashbridges Bay, and Humber WWTPs.

Toronto Sewage Pumping Stations Automation Upgrades, City of Toronto, ON

Project Manager, responsible for the pre-design, design, and implementation; of automation, process control, and SCADA upgrades at ten wastewater pumping stations.

Fairmount Pumping Station Rehabilitation - Automation Upgrades, Cleveland, Ohio, USA

Project Engineer, responsible for designs the automation and process control / monitoring upgrades and expansion, and SCADA integration, of a 375MLD (85MGD) distribution pumping station.

Water Supply Transmission SCADA System (PCS project), City of Toronto, ON

Project Manager/Design Manager, responsible for a multi-phase project involving the City's water transmission system (20 pumping stations, 20 storage reservoirs/tanks, 75 metering and other monitoring sites), which has a capacity in excess of 2,500MLD (550MGD). The project involved field assessment of all instrumentation and control systems, management of the wide-area network and SCADA team, and the design management and field test protocol development for the design- build phase.

Oshawa/Whitby/Ajax Plants and Distribution System, Regional Municipality of Durham, ON

Project Manager/Design Manager, responsible for the rehabilitation and extension of instrumentation, control, and automation systems for water treatment plants and multi-zone distribution system facilities; provided the implementation of a Wide Area Network (WAN) SCADA system, that enables system-wide operation from designated central locations.

Burlington/Oakville Water Treatment and Distribution System, Regional Municipality of Halton, ON

Project Manager/Designer, responsible for providing reports and system design; and contractor pre-qualification, tender documents preparation and contract administration; for area SCADA system for the Halton Region's south district treatment plants and distribution system facilities.

Ottawa Water Treatment Plants and Distribution System, Regional Municipality of Ottawa- Carleton, ON

Project Manager/Designer, responsible for providing reports and system design; contractor pre-qualification and tender documents preparation; major instrumentation, control, and automation retrofits, and contract administration for area SCADA system; which has two 290MLD (63MGD) treatment plants and a multi-zone distribution system.

Mannheim Scheme system, Regional Municipality of Kitchener-Waterloo, ON

Prime Technical Consultant, responsible for instrumentation and controls for multiple projects within the Mannheim area scheme; Acted as Project Manager for plant I&C and SCADA design and tender documents, for a 90MLD (20MGD) full treatment facility.

Niagara Falls Water Treatment Plant and Distribution System, Regional Municipality of Niagara, ON
Project Manager /Designer, responsible for SCADA system development and implementation of a 135MLD (30MGD) treatment plant and distribution facilities.

Wastewater Treatment Plants, Regional Municipality of Niagara, ON

Project Manager / Design Manager, responsible for instrumentation/control upgrades and SCADA implementation at Fort Erie, Welland, Crystal Beach, and Niagara Falls WWTPs; as part of the overall process expansion and upgrades projects.

Georgina Water Treatment Plant, Regional Municipality of York, ON

Project Manager, responsible for the pre-design and design for plant SCADA system, and preparing for future integration into Region-wide SCADA system.

South Sidney Water Treatment Plant and System, Township of Sidney, ON

Project Manager, responsible for the design of the SCADA system for a new full treatment facility, including ozonation and GAC filtration.

Warton Water Treatment Plant and System, Town of Warton, ON

Project Manager / Design Manager, responsible for the instrumentation and controls design and SCADA implementation of a new surface water treatment plant.

Lindsay Water Treatment Plant and System, Town of Lindsay Water Board, Lindsay, ON Project Manager, responsible for the SCADA/ Automation Design for a surface water treatment plant and distribution system facilities.

Blind River Water Treatment Plant SCADA. ON

Project Engineer, responsible for the SCADA design of a conventional treatment and GAC filtration plant.

Vermilion Bay Water Treatment Plant SCADA, ON

Project Engineer, responsible for a SCADA design to integrate the package plant with pumping and residual management.

Courtice Pollution Control Plant SCADA, Regional Municipality of Durham, ON

Project and Program Manager, responsible for design standards development for the SCADA and instrumentation/controls of the wastewater treatment plant; provided the design of the SCADA system.

Energy/Power Projects Experience

Energy Optimization Study, Edmonton Water, Edmonton, AB

Project Manager, responsible for field studies of energy use and power quality across the entire distribution system. Analyzed energy conservation opportunities and improvements costing; analyzed operating methods variances to take advantage of rate riders and schedule riders offered by power utility; prepared a final report recommending operational and system changes, with less than 12-month payback.

Energy Projects, Regional Municipality of Durham, ON

- Project Manager, responsible for a standby power needs study for the Oshawa, Whitby, Ajax areas (Lake Ontario Water Supply Plants) and distribution systems to assess: system storage capacities, pressure zone consumptions under power failure conditions, and to recommend standby power provision; to ensure continuity of service to consumers in extended wide-area power failure circumstances.
- Project Manager, responsible for an Energy Audit of the Lake Ontario Water Supply and Distribution System, involving field studies of pump/motor efficiencies and providing recommendations on changes in equipment and procedures to reduce energy consumption and energy costs.
- Project Manager, responsible for field investigations of energy use and power quality at the Corbett Creek WPCP; investigated harmonics, power factor, and fault protection; followed up with a report and the design for electrical distribution system upgrades and expansion, including provision of a 27.6kV supply and 4MVA transformers.

Energy Project, City of Toronto, ON

Project Manager, responsible for an Energy Optimization Study focused on operational practices for the Eglinton Pumping Station, as part of Toronto PCS project.

Miscellaneous Experience

Alternate Services Delivery, City of Winnipeg, MB

Process Engineer / Water Treatment, responsible for providing alternative delivery methods for chemicals at Deacon and Shoal Lake water treatment facilities. Provided economic, environmental, sustainability, and risk evaluations for various road/private rail alternatives.

Plant Maintenance Program Operational Plan, Regional Municipality of Halton, ON

Project Manager and Author of a future development plan to allow the plant maintenance group to identify present states and to provide a future vision; the plan included gap analysis and needs analysis, and 10-year implementation plan.

City of Sault Ste. Marie WWTP Improvements, Sault Ste. Marie, ON

Project Manager and Process Engineer, responsible for the process review and report on alternatives for dechlorination using outfall retention time. Developed a preliminary design concept, with calculations, in support of applications for regulatory approvals.

Value Engineering, Regional Municipality of Peel, ON

QA/QC, provided program development and application for multiple value engineering projects for Clarkson WWTP and Lakeview WTP, as part of Peel's Capital Projects Delivery Program.

Chlorine Handling Upgrades, Ashbridges Bay WWTP, City of Toronto, ON

Project Engineer, responsible for a report and the preliminary designs for railcar weighbridges for bulk chlorine deliveries, and operator access safety and protection systems.

Infrastructure Improvements Program, Regional Municipality of York, ON

Technical Author, responsible for 15 discrete infrastructure improvement project's scope development, including project delivery plans and cost estimates. Projects included water supply, infrastructure management, and automation upgrades for both water and wastewater facilities.

WTP Disaster Recovery Costing, Timmins, ON

Engineering Author, responsible for a high-level disaster recovery plan and schedule for restoring the water treatment plant after a catastrophic flood caused by power dam failure. The report included phased restoration of service levels and estimates of cost for alternate services provided during restoration.

Perth Water Treatment Plant, Perth Water Board, Perth, ON

Project Manager and Principal Author, responsible for facility operations analysis, including evaluation of work practices, responsibilities, and authorities; giving consideration to SDWA compliance issues affected by organizational and operating strategies

Engineer's Reports Under Drinking Water Protection O. Regulation 459/00 – ON

Region of Durham: Ajax Water Supply Plant

Region of York: Keswick Water Treatment Plant, Sutton Water Treatment Plant, and Keswick Standpipe

Facility Operations Manuals: Safe Drinking Water Act Compliance – ON

Keswick Water Treatment Plant

Vermilion Bay Water Treatment Plant

Perth Water Treatment Plant

Blind River Water Treatment Plant

Industrial Experience

Johns-Manville, Water Treatment System Design Report

Mayfair Racquet Club, Groundwater System Design

Region of Waterloo for Federal Department of Supply and Services, Industrial Processes and Wastes Survey

Industrial Liquid Waste Treatment Plant, Ajax, Ontario, Conceptual Reports and Detail Design

Wabash Alloys, Chlorine Storage and Feed Systems Design

Minute Maid, Water Treatment System Options Pre-design, and Implementation of Treatment Facility using ultrafiltration, GAC polishing, and UV Disinfection

Other

Author of original MOE Design Guidelines for Water Purification Plants

Author of 15 articles on advanced waste treatment and water treatment

Expert testimony appearances before Ontario Municipal Board, Environmental Assessment Board and Supreme Court of Ontario

Y2K assessments and test validation for City of Toronto water transmission system facilities & equipment

Member of Mayor's Task Force on Pickering Waterfront Planning

Member & Chair - Professional Standards Committee, Professional Engineers of Ontario

Public Member, Prince Edward County Ad Hoc Committee on Water and Wastewater Rates